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#### 1. INTRODUCTION & CONTEXT

This Shadow Study [herein referred to as the 'Study'] has been prepared by Weston Consulting on behalf of DVB Real Estate Investments Inc., to illustrate potential shadow impacts from the proposed development. The shadow diagrams in this Study have been prepared by Holly Templeton and have been reviewed by Shane Morgan.

The development site is located at 3016, 3020, 3026 & 3032 Kirwin Avenue and 3031 Little John Lane in the City of Mississauga. The proposed development consists of a single residential, mid-rise building. The building will be 8 storeys in height, measuring 25.5 metres [north frontage], and will supply 148 residential units with associated amenity provision, landscaping, and 2 levels of underground parking for vehicular and bicycle use. The building is configured in an a-typical 'bow' shape, and occupies the centre of the development site, fronting Kirwin Avenue.

The site is located adjacent to the John C. Price Park, with a portion of the assembled lands located within the Credit Valley Conservation Authority [CVCA] regulation limits, associated with the Cooksville Creek and watershed area. The developable area has been determined as 3,923m² following discussions with CVCA Staff and the proponent.

This Study is in support of applications for an Official Plan and Zoning By-Law Amendment to facilitate the proposed development.



Figure 1: Aerial of Proposed Development Site Location

#### 2. REQUIREMENTS & METHODOLOGY

This Study has been prepared in accordance with the Mississauga *Urban Design Terms of Reference: Standards for Shadow Studies*, 2014 [TOR]. The Study illustrates the impact of the proposed development on sunlight access for the surrounding area. These areas have been assessed according to the referenced Criteria of the TOR within the established Study Area, determined as 4.0 times the building height to the north, east and west, and 1.5 times the building height to the south.

To note, shadow diagrams at sunrise and sunset have not been included, as shadows during these hours are not visible. In addition, no recently approved development was identified within the Study Area limits.

As established in the TOR, the Mississauga Official Plan, Section 19.4.5, identifies a Shadow Study as a Study that City staff may request as one of the requirements for a complete application. This Study is required to demonstrate that the location and height of the proposed building, at 8 storeys [25.5 metres to the mechanical penthouse], will not cause undue shade on the subject lands and the surrounding context. This includes building facades, private and public outdoor amenity and open spaces, public parkland, sidewalks and other components of the public realm.

Base Plan Source: Mississauga Parcel Open Data 2016

Longitude/Latitude at Kirwin Avenue and Dundas Street

East intersection: 43°35′00.7″N, 79°36′45.4″W

Astronomic or True North determined using GPS Google Map Data 2020.

The following dates and times have been assessed according to the TOR:

#### Dates

- June 21st
- September 21st (Criteria for September 21 are deemed to apply to March 21)
- December 21st

#### Times

- Solar Noon (SN)
- Hourly intervals before and after Solar Noon (SN), up to and including 1.5 hours after sunrise and 1.5 hours before sunset



KEY MAP 1: STUDY AREA, AMENITY & PUBLIC REALM

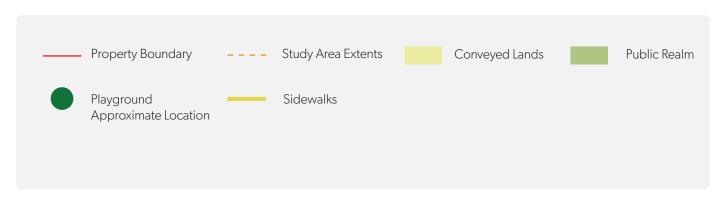


Figure 2: Key Map 1: Study Area, Amenity & Public Realm



**KEY MAP 2:** BUILDING HEIGHTS & IMPACT ZONES



Figure 3: Key Map 2: Bulding Heights & Impact Zones

#### 3. ASSESSMENT CRITERIA

### 3.1 RESIDENTIAL PRIVATE OUTDOOR AMENITY SPACE

Residential private outdoor amenity space is defined as private rear yards, decks, patios and pools of surrounding residential dwellings, as per the Mississauga TOR. There are no pools identified within the Study Area. The following residential dwellings with private rear yards are located at the following locations within the Study Area: 3080, 3070, 3066, 3056, 3050, and 3044 Kirwin Avenue [south side], and 3033, 3037, 3043, 3047, 3055, 3057, 3061, 3067, 3075 and 3081 Kirwin Avenue [north side]. The line of impact assessment is measured 7.5m from the rear exterior wall of the dwelling abutting the private amenity area. This is described as the "no impact zone". These have been identified in Key Map 2 [Figure 3].

This Criterion is met if there is shadow impact for no more than two consecutive hourly test times within the "no impact zone". Any new shadows generated by the proposal should not result in less than 2 hours of direct sunlight. Where less than 2 hours of sunlight already exists within the "no impact zone", the Criterion is not met if any cumulative shade is added.

This Criterion is met for the month of June, with no new incremental shadow impacts incurred within the Study Area. There are shadow impacts observed within the "no impact zones" of the properties at 3044 and 3050 Kirwin Avenue [south side] during the month of September. This Criterion can be considered to be met, as impacts primarily occur between the hours of 08:35 and 10:20, [a 2 hour window], with only minor impacts observed by 11:20 on the rear yard of 3044 Kirwin Avenue.

#### 3.2 COMMUNAL OUTDOOR AMENITY AREAS

Communal outdoor amenity areas are defined as areas which include children's play areas, school yards, tot lots, and park features such as sandboxes, wading pools etc, and amenity areas used by seniors and those associated with commercial and employment areas during spring, summer, fall and winter. There is a children's play area identified in the Study Area, located within the John C. Price Park adjacent to the site. The location of the playground is approximated in Key Map 1 [Figure 2]. The total approximate area of the playground in 352m².

This Criterion is met if the "sun access factor" is a minimum of 50%. This is calculated by measuring the total area of the communal outdoor amenity area and determining the area receiving sunshine from 1.5 hours after sunrise to 1.5 hours before sunset. The average is calculated to arrive at the sun access factor.

The Criterion is met across all three test dates. The average sun access factor is 0.99 for June 21st, September 21st and December 21st. A sun access factor of 0.79 is recorded at 07:07 on June 21st. [see Table 1 - 3].

Table 1. Criterion 3.2 - June 21st 2020 [-4 UTC]

Local Time [EDT]	Azimuth [degrees]	Total Area Within Study Area	Area in Shadow [proposed building]	Area in Sunshine	Sun Access Factor
[Rise] 5:37	235.73	352m²	n/a	n/a	n/a
7:07	250.48	352m²	71m²	281m²	0.79
7:20	252.58	352m²	>lm²	351m²	0.99
8:20	262.02	352m²	Om²	352m²	1.00
9:20	272.04	352m²	Om²	352m²	1.00
10:20	283.79	352m²	Om²	352m²	1.00
11:20	299.52	352m²	Om²	352m²	1.00
12:20	323.67	352m²	Om²	352m²	1.00
[Solar Noon] 13:20	0.00	352m <sup>2</sup>	Om <sup>2</sup>	352m²	1.00
14:20	36.32	352m²	Om²	352m²	1.00
15:20	60.47	352m²	Om²	352m²	1.00
16:20	76.21	352m²	Om²	352m²	1.00
17:20	87.96	352m²	Om²	352m²	1.00
18:20	97.98	352m²	Om²	352m²	1.00
19:20	107.42	352m²	Om²	352m²	1.00
19:33	109.41	352m²	Om²	352m²	1.00
[Set] 21:03	124.27	352m²	n/a	n/a	n/a

Table 2. Criterion 3.2 - September 21st 2020 [-4 UTC]

Local Time [EDT]	Azimuth [degrees]	Total Area Within Study Area	Area in Shadow [proposed building]	Area in Sunshine	Sun Access Factor
[Rise] 7:05	268.27	352m²	n/a	n/a	n/a
8:35	284.22	352m²	>1m²	351m²	0.99
9:12	291.23	352m²	Om²	352m²	1.00
10:12	304.14	352m²	Om²	352m²	1.00
11:12	319.68	352m²	Om²	352m²	1.00
12:12	338.54	352m²	Om²	352m²	1.00
[Solar Noon] 13:12	0.00	352m²	Om <sup>2</sup>	352m²	1.00
14:12	21.45	352m²	Om²	352m²	1.00
15:12	40.28	352m²	Om²	352m²	1.00
16:12	55.79	352m²	Om²	352m²	1.00
17:12	68.68	352m²	Om <sup>2</sup>	352m²	1.00
17:48	75.63	352m²	Om²	352m²	1.00
[Set] 19:18	91.46	352m²	n/a	n/a	n/a

Table 3. Criterion 3.2 - December 21st 2020 [-5 UTC]

Local Time [EDT]	Azimuth [degrees]	Total Area Within Study Area	Area in Shadow [proposed building] m²]	Area in Sunshine	Sun Access Factor
[Rise] 7:49	302.37	352m²	n/a	n/a	n/a
9:19	319.05	352m²	Om <sup>2</sup>	352m²	1.00
10:17	331.25	352m²	Om <sup>2</sup>	352m²	1.00
11:17	345.21	352m²	Om <sup>2</sup>	352m²	1.00
[Solar Noon] 12:17	0.00	352m <sup>2</sup>	Om <sup>2</sup>	352m²	1.00
13:17	14.79	352m²	Om²	352m²	1.00
14:17	28.75	352m²	Om²	352m²	1.00
15:15	41.06	352m²	Om <sup>2</sup>	352m²	1.00
[Set] 16:45	57.63	352m²	n/a	n/a	n/a

#### 3.3 PUBLIC REALM

The public realm is defined as *sidewalks*, *open spaces*, *parks and plazas* according to the Mississauga TOR. These areas are identified in Key Map 1 [see Figure 2], consisting mainly of the John C. Price Park, and north and south side sidewalks of Kirwin Avenue. As Kirwin Avenue has both commercial and residential uses fronting the street, the assessment Criteria for mixed-use streets has been utilized for this analysis. The Criteria is met if there is no incremental shade on the public street [sidewalk] at the following times on September 21st:

- 12:12, 13:12, and 14:12, and;
- Three consecutive times, at either: 09:12, 10:12 and 11:12, or;
- 15:12, 16:12, and 17:12.

The Criteria have been met for the following reasons:

- The opposite boulevard of Kirwin Avenue receives full sunlight between 12:12 and 14:12;
- The opposite boulevard of Kirwin Avenue receives full sunlight for an additional 2 hour period between 09:12 and 11:12 and;
- No incremental shade is evident on the opposite boulevard at 12:12 to 14:12 and three consecutive hours between 9:12-11:12.

Table 4. Criterion 3.3 - September 21st 2020 [-4 UTC] Parks

Local Time [EDT]	Azimuth [degrees]	Total Area Within Study Area	Area in Shadow [proposed building]	Area in Sunshine	Sun Access Factor
[Rise] 7:05	268.27	17,367m²	n/a	n/a	n/a
8:35	284.22	17,367m²	5,216m²	12,151m²	0.69
9:12	291.23	17,367m²	2,408m²	14,959m²	0.86
10:12	304.14	17,367m²	996m²	16,371m²	0.94
11:12	319.68	17,367m²	530m²	16,837m²	0.96
12:12	338.54	17,367m²	271m²	17,096m²	0.98
[Solar Noon] 13:12	0.00	17,367m²	86m²	17,367m <sup>2</sup>	1.00
14:12	21.45	17,367m²	Om²	17,367m²	1.00
15:12	40.28	17,367m <sup>2</sup>	Om²	17,367m²	1.00
16:12	55.79	17,367m²	Om²	17,367m²	1.00
17:12	68.68	17,367m²	Om²	17,367m²	1.00
17:48	75.63	17,367m²	Om²	17,367m²	1.00
[Set] 19:18	91.46	17,367m²	n/a	n/a	n/a

#### 3.4 TURF & FLOWER GARDENS

The proposed development must meet a sun access factor of 50% for public open spaces, park and plazas on September 21st. The John C. Price Park is the only identified open space within the Study Area. The area of the park that falls within the Study Area is 17,367m², of an approximate total area of 22,000m² [2.2 hectares]. The sun access factor has been calculated exclusive of Little John Lane and the lands proposed to be dedicated to the south west.

This Criterion has been met, as the sun access factor achieved for September 21st is on average, 0.95. The lowest recorded sun access factor is at 08:35 at 0.69. See Table 4.

There are no turf or flower gardens identified within the Study Area.

## 3.5 BUILDING FACES TO ALLOW FOR THE 4. SUMMARY POSSIBILITY OF USING SOLAR ENERGY

Shadows from proposed development should not impact the roof, front, rear and exterior side walls of adjacent low-rise properties up to four storeys for more than one hour. The line of impact assessment is detailed in Key Map 2 [Figure 3]. The properties within the Study Area subject to these protections for the potential of harnessing solar energy, include the following properties: 3080, 3070, 3066, 3056, 3050, and 3044 Kirwin Avenue [south side], and 3033, 3037, 3043, 3047, 3055, 3057, 3061, 3067, 3075 and 3081 Kirwin Avenue [north side].

There are moderate impacts on the rear and side exterior facade of the property located at 3044 Kirwin Avenue between 09:12 and 11:12. Therefore, there are no impacts at more than two consecutive test times. As this is the only area impacted, and the impact is partial in nature, this Criterion is considered to be satisfied.

All Criteria contained within the Mississauga TOR have been met. It has been demonstrated that built form articulation and building placement strategies have adequately mitigated shadowing impacts.

#### 5. SHADOW DIAGRAMS



JUNE 21st - 07:07



Figure 4: June 21st 07:07

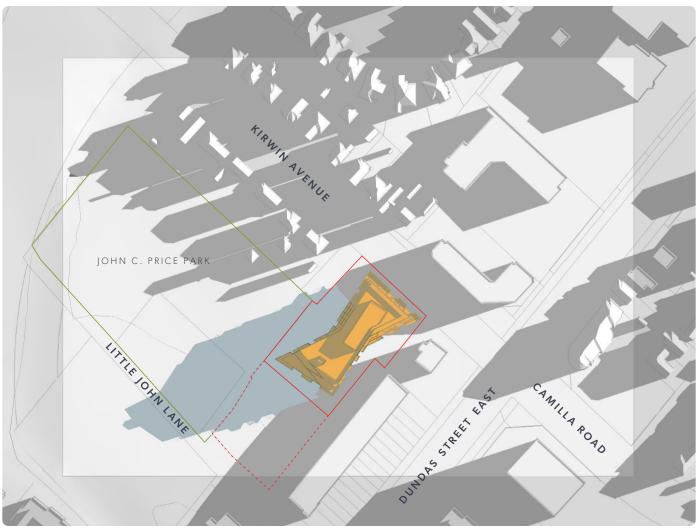




Figure 5: June 21st 07:20

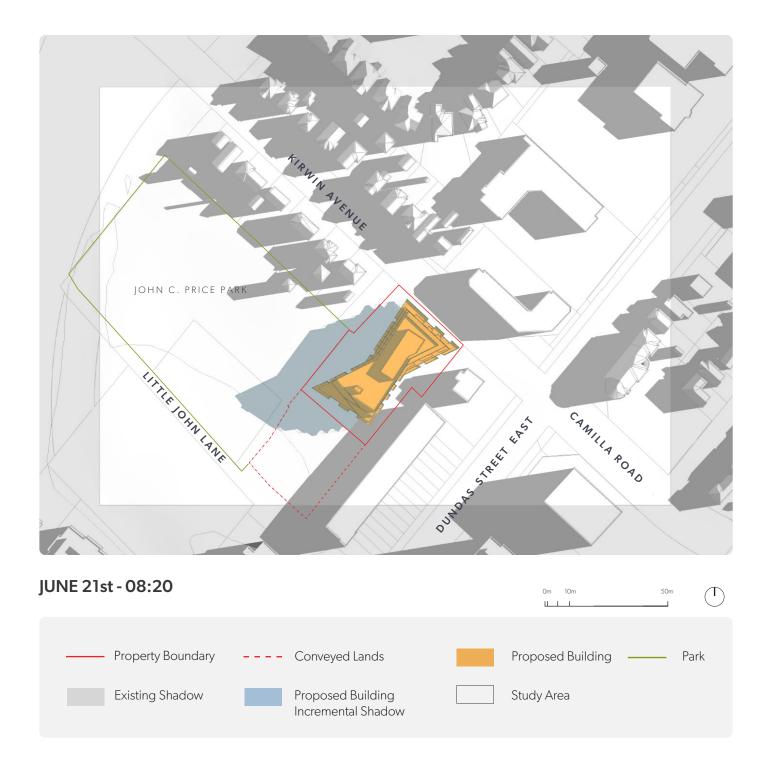




Figure 7: June 21st 09:20

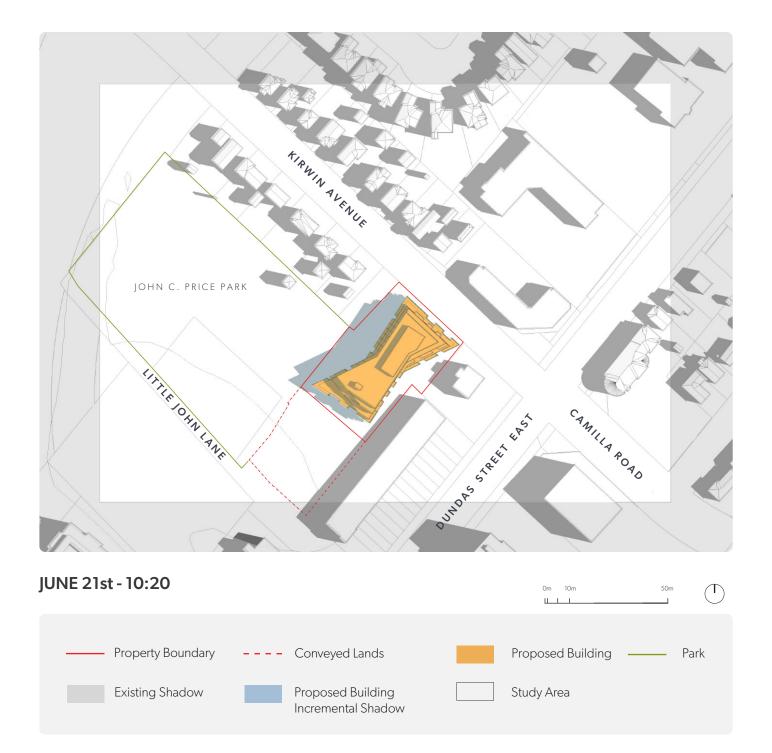


Figure 8: June 21st 10:20

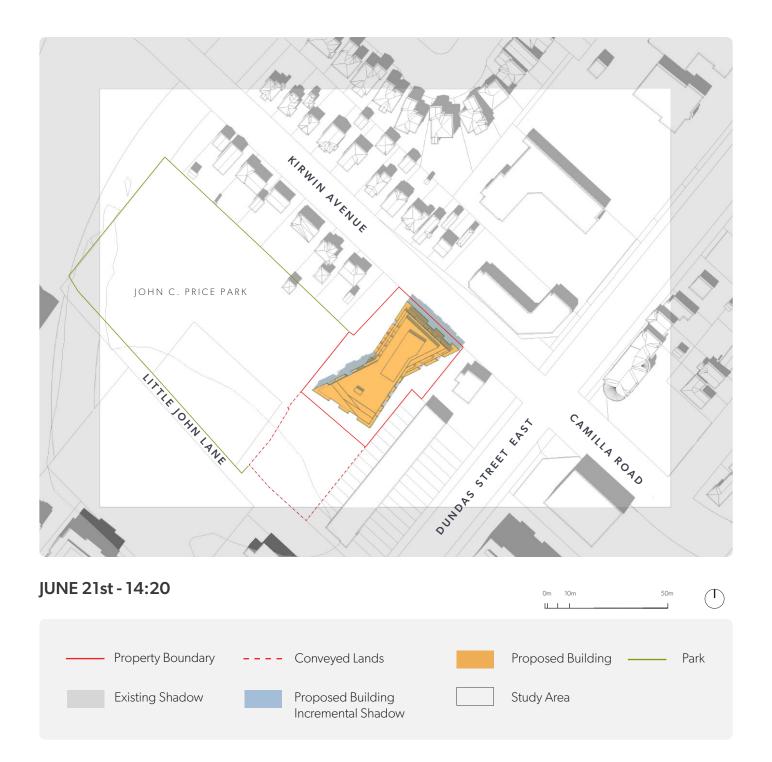


Figure 9: June 21st 11:20





Figure 11: June 21st 13:20



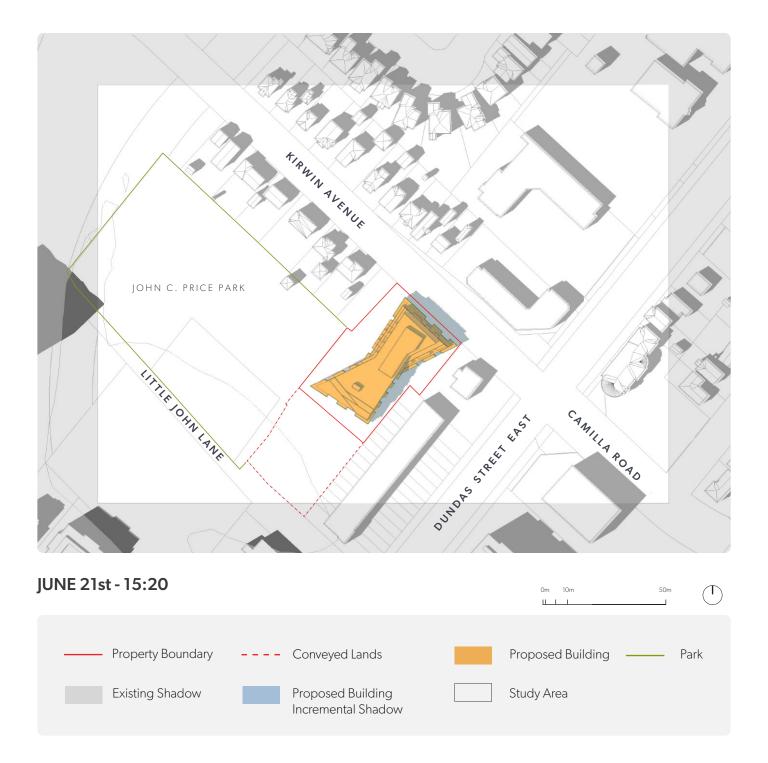


Figure 13: June 21st 15:20

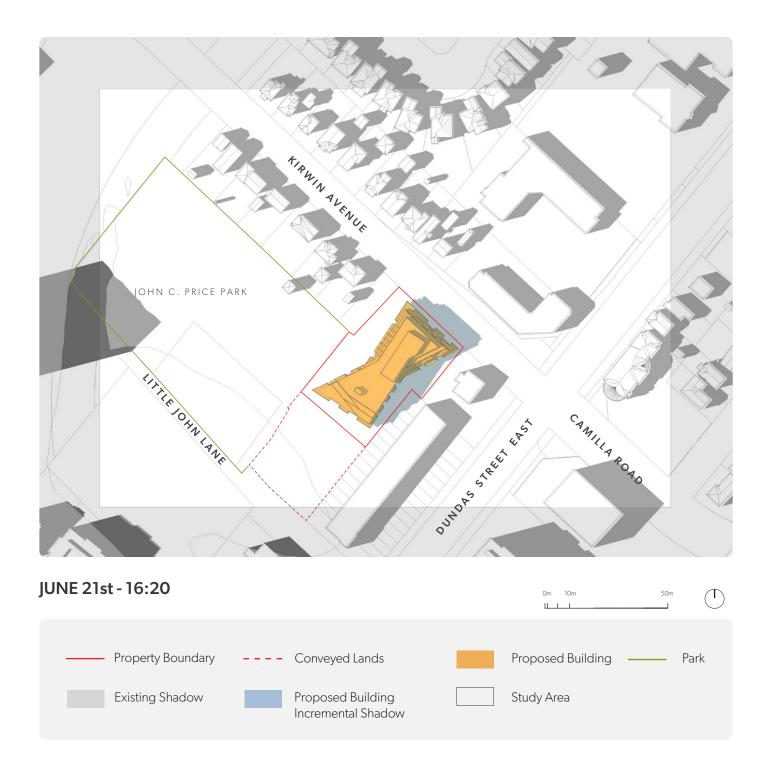


Figure 14: June 21st 16:20

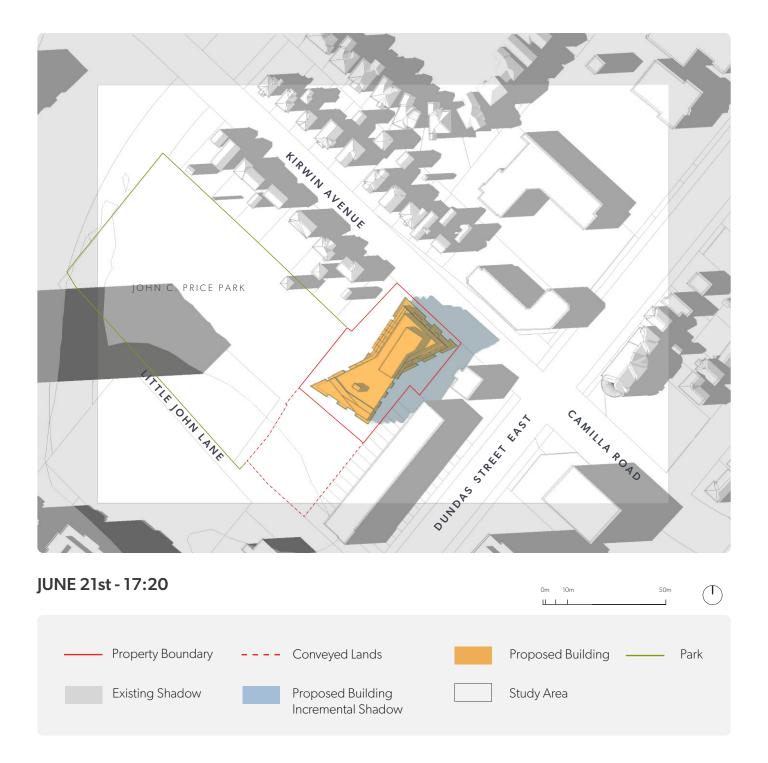
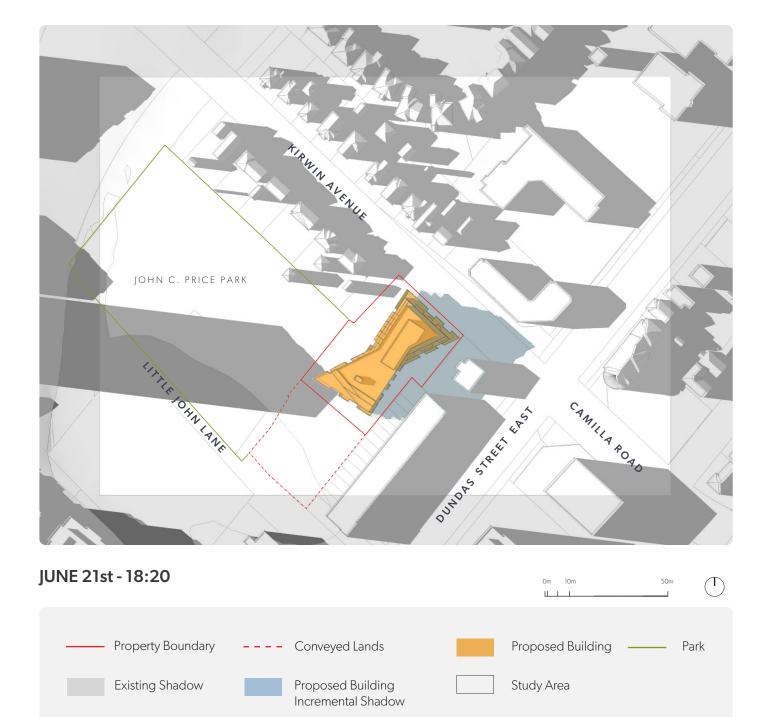


Figure 15: June 21st 17:20



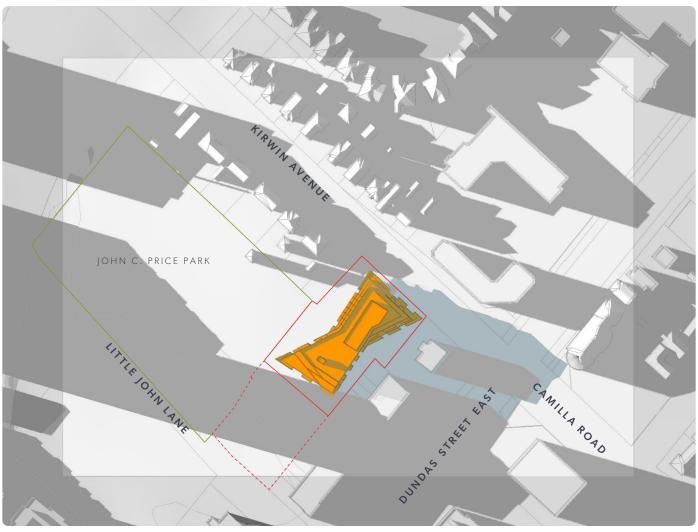




Figure 17: June 21st 19:20

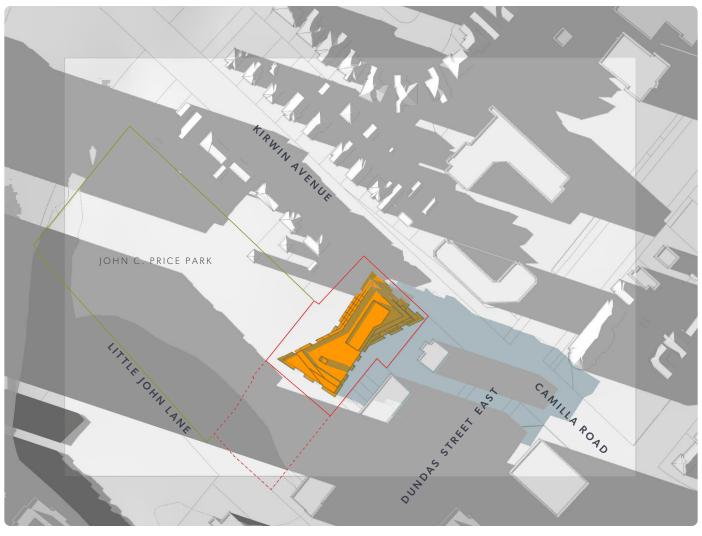




Figure 18: June 21st 19:33

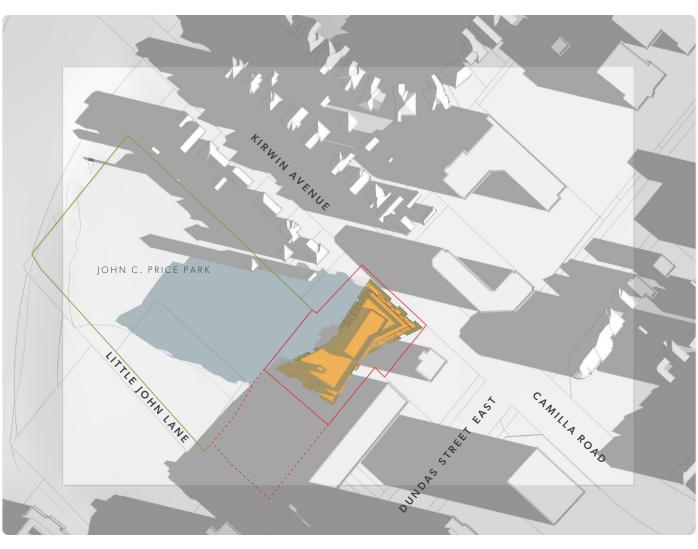




Figure 19: September 21st 08:35



Figure 20: September 21st 09:12



Figure 21: September 21st 10:12



Figure 22: September 21st 11:12

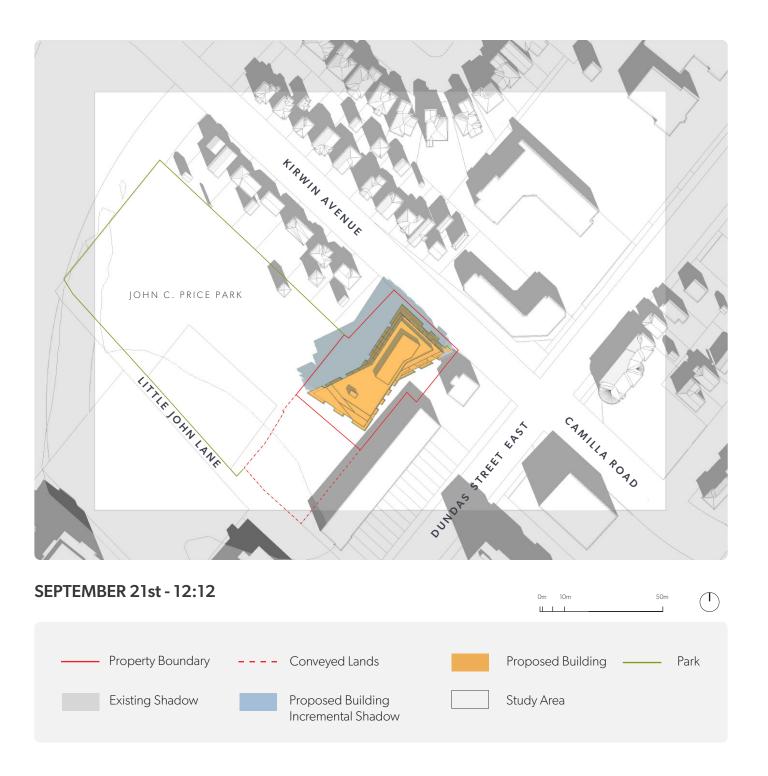


Figure 23: September 21st 12:12



Figure 24: September 21st 13:12



Figure 25: September 21st 14:12



Figure 26: September 21st 15:12



Figure 27: September 21st 16:12



Figure 28: September 21st 17:12

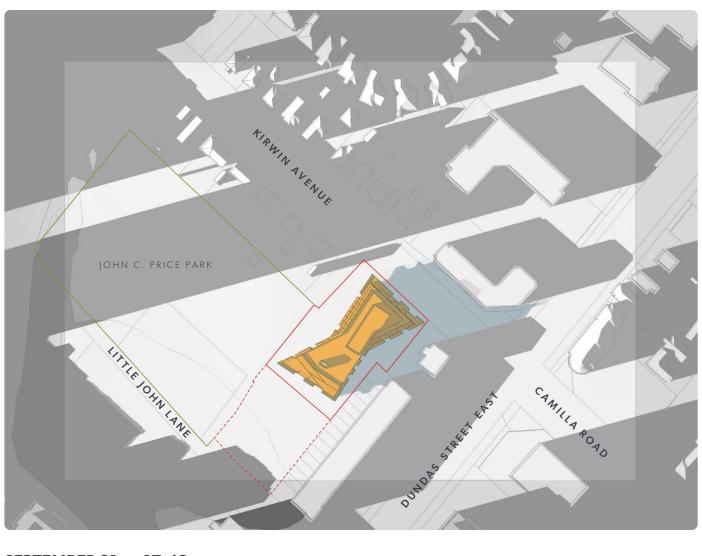
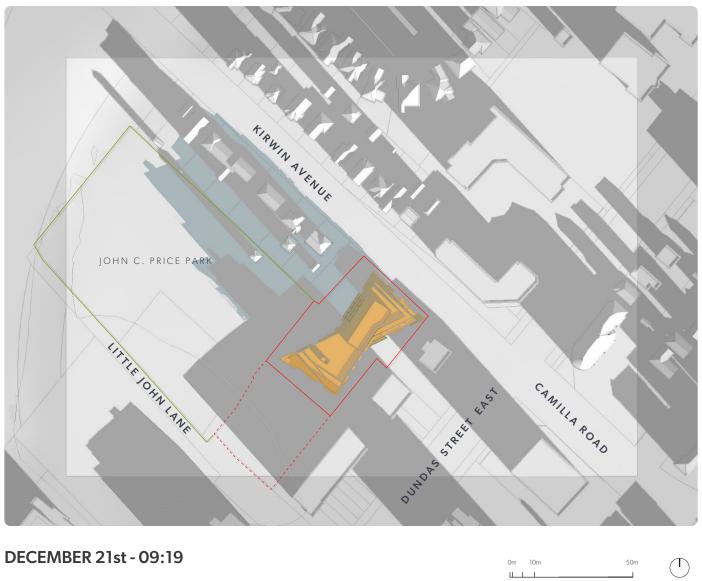




Figure 29: September 21st 17:48



DECEMBER 21st - 09:19

— Property Boundary ---- Conveyed Lands Proposed Building — Park

Existing Shadow Proposed Building Incremental Shadow Study Area

Figure 30: December 21st 09:19



Figure 31: December 21st 10:17

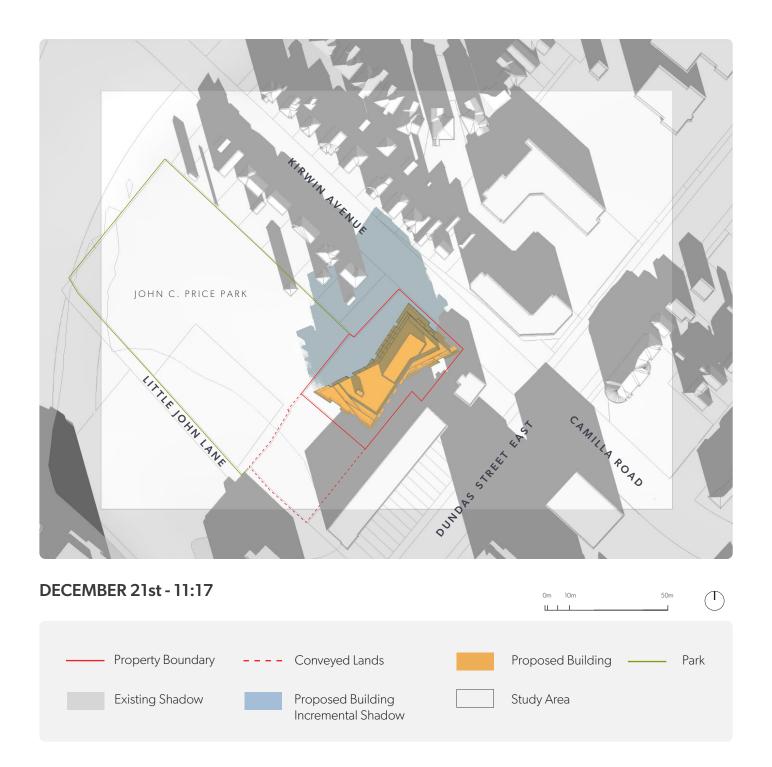


Figure 32: December 21st 11:17



Figure 33: December 21st 12:17

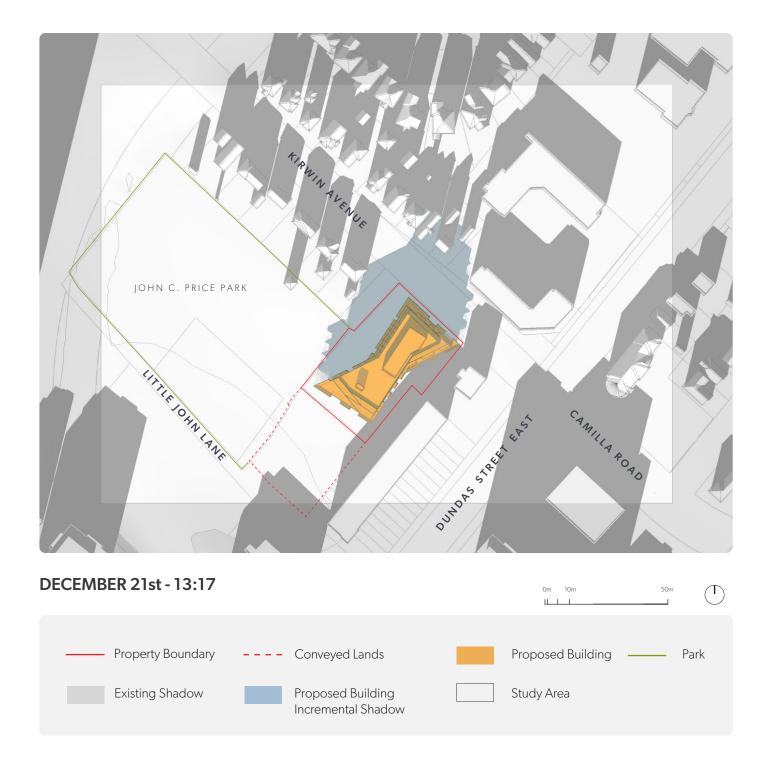


Figure 34: December 21st 13:17



Figure 35: December 21st 14:17

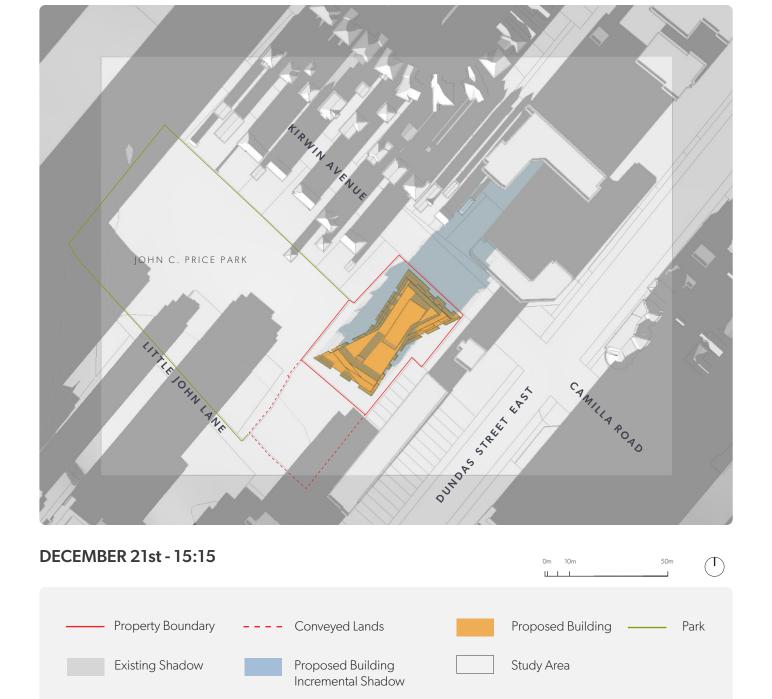


Figure 36: December 21st 15:15

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